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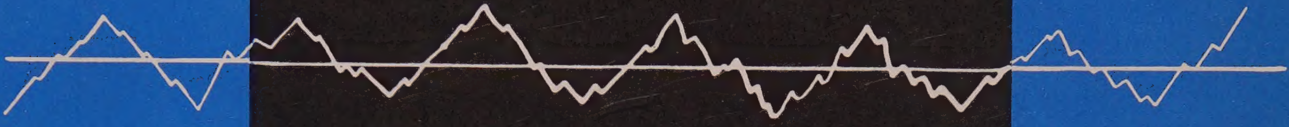

May 1960

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Director's Letter

Dear Member:

Every once in a while someone calls me a "dedicated man." I wish I were, but I'm not. I'm merely curious—and dogged. You, who provide the money so that I can try to satisfy my curiosity, are the dedicated ones!

Of course, anyone who would rather satisfy his curiosity than make money is himself a curiosity. A "nut." I plead guilty.

I've never heard this aberration better described than in an address made last year by Professor E. S. Morgan of the Yale History Department. The address is called "What Every Yale Freshman Should Know." The talk* is reproduced here with the permission of Dr. Morgan and of the *Saturday Review,* which printed a condensation of Dr. Morgan's address in their issue of January 2. When you read it you will see that your curiosity and mine let both of us into the company of the elect.

WHAT EVERY YALE FRESHMAN SHOULD KNOW*

The world does not much like curiosity. The world says that curiosity killed the cat. The world dismisses curiosity by calling it idle, or *mere* idle, curiosity—even though curious persons are seldom idle. Parents do their best to extinguish curiosity in their children, because it makes life difficult to be faced every day with a string of unanswerable questions about what makes fire hot or why grass grows or to have to halt junior's investigations before they end in explosion and sudden death. Children whose curiosity survives parental discipline and who manage to grow up before they blow up are invited to join the Yale faculty. Within the university they go on asking their questions and trying to find the answers. In the eyes of a scholar, that is mainly what a university is for. It is a place where the world's hostility to curiosity can be defied.

Some of the questions that scholars ask seem to the world to be scarcely worth asking, let alone answering. They ask about the behavior of protons, the dating of a Roman coin, the structure of a poem. They ask questions too minute and specialized for you and me to understand without years of explanation.

If the world inquires of one of them why he wants to know the answer to a particular question, he may say, especially if he is a scientist, that the answer will in some obscure way make possible a new machine or weapon or gadget. He talks that way because he knows that the world understands and respects utility and that it does not understand much else. But to his colleagues and to you he will probably not speak this language. You are now part of the university, and he will expect you to understand that he wants to know the answer simply because he does not know it, the way a mountain climber wants to climb a mountain simply because it is there.

"Similarly a historian, when asked by outsiders why he studies history, may come out with a line of talk that he has learned to repeat on such occasions, something about knowledge of the past

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making it possible to understand the present and mold the future. I am sure you have all heard it at one time or another. But if you really want to know why a historian studies the past, the answer is much simpler: he wants to know about it because it is there. Something happened, and he would like to know what:

All this does not mean that the answers which scholars find to their questions have no consequences. They may have enormous consequences; they may completely alter the character of human life. But the consequences seldom form the reason for asking the questions or pursuing the answers. It is true that scholars can be put to work answering questions for the sake of the consequences, as thousands are working now, for example, in search of a cure for cancer. But this is not the primary function of the scholar. For the scholar the consequences are usually incidental to the satisfaction of curiosity. Even for the medical scholar, the desire to stamp out a dreaded disease may be a less powerful motive than the desire to find out about the nature of living matter. Similarly Einstein did not wish to create an atomic bomb or to harness atomic energy. He simply wanted to find out about energy and matter.

I said that curiosity was a dangerous quality. It is dangerous not only because of incidental effects like the atomic bomb but also because it is really nothing more or less than a desire for truth. For some reason this phrase sounds less dangerous than curiosity. In fact, the desire for truth sounds rather respectable. Since so many respectable people assure us that they have found the truth, it does not sound like a dangerous thing to look for. But it is. The search for it has again and again overturned institutions and beliefs of long standing, in science, in religion, and in politics. It is easy enough to see today that these past revolutions brought great benefits to mankind. It was less easy to see the benefits while the revolutions were taking place, especially if you happened to be quite satisfied with the way things were before. Similarly it is not always easy today to see that the satisfaction of a scholar's curiosity is worth the disruption of society that may result from it. The search for truth is, and always has been, a subversive activity. And scholars have learned that they cannot engage in it without an occasional fight.

You may therefore find them rather belligerent toward any threat to the free pursuit of curiosity. They are wary of committing themselves to institutions or beliefs that might impose limitations on them or deliver ready-made answers to their questions. You will find them suspicious of loyalty oaths, religious creeds, or affiliations with political parties. In particular they will try to preserve their university as a sancturay within whose walls *any* question can be asked.

This wariness of commitment can sometimes degenerate into a scholarly vice, a vice that paralyzes curiosity instead of preserving it. A scholar at his worst sometimes seems to be simply a man who cannot make up his mind. Every classroom from here to Melbourne has echoed with the feeble phrases of academic indecision: "There are two schools of thought on this question, and the truth probably lies halfway between them." When you hear this sentence repeated, or when you are tempted to repeat it yourself, remember that the truth may lie between two extremes, but it assuredly does not lie halfway between right and wrong. Don't short-circuit your curiosity by assuming you have found the answer when you have only made a tidy list of possible answers.

Dedication to curiosity should not end in indecision. It should, in fact, mean willingness to follow the mind into difficult decisions.

A second quality that makes a scholar has no apparent relation to the first and yet is inseparably connected to it. It is a compulsion to communicate. A scholar is driven by a force as strong as his curiosity, that compels him to tell the world the things he has learned. He cannot rest with learning something: he has to tell about it. Scholarship begins in curiosity, but it ends in communication. And though scholars may in a university take refuge from the world, they also acknowledge responsibility to the world, the responsibility to communicate freely and fully everything that they discover within the walls of their sanctuary. The search for truth needs no justification, and when a man thinks he had found any part of it, he cannot and ought not to be silent. The world may sometimes not care to listen, but the scholar must keep telling it until he has succeeded in communicating.

Now, there are only two methods of communication for scholars, writing and speaking. The scholar publishes his discoveries in books and articles and he teaches them in the classroom. Sometimes one or the other method will satisfy him, but most of us feel the need for both. The scholar who merely writes books falls into the habit of speaking only to the experts. If he works at his subject long enough, he reaches the position where there is no one else quite expert enough to understand him, and he winds up writing to himself. On the other hand, if he writes not at all, he may become so enamored of his own voice that he ceases to be a scholar and becomes a mere showman.

Communication is not merely the desire and the responsibility of the scholar; it is his discipline, the proving ground where he tests his findings against criticism. Without communication his pursuit of truth withers into eccentricity. He necessarily spends much of his time alone, in the library or the laboratory, looking for the answers to his questions. But he needs to be rubbing constantly against other minds. He needs to be tested, probed, and pushed around. He needs to be made to explain himself. Only when he has expressed himself, only when he has communicated his thoughts, can he be sure that he is thinking clearly.

The scholar, in other words, needs company to keep him making sense. And in particular he needs the company of fresh minds, to whom he must explain things from the beginning. He needs people who will challenge him at every step, who will take nothing for granted. He needs, in short, you.

You may have various purposes in coming here, and you may fulfill them: you may play football or tennis or the trombone; you may sing in the glee club, act in plays, and act up on college weekends. But what the faculty expects of you is four years of scholarship, and they will be satisfied with nothing less. For four years we expect you to join us in the pursuit of truth, and we will demand of you the same things we demand of ourselves: curiosity and communication.

Curiosity, of course, is not something you get simply by wishing for it. But it is surprisingly contagious. The curiosity we expect is more than a passing interest. We will not be satisfied by your ability to ask an occasional bright question, nor yet by your assimilation of a lot of predigested information. The accumulation of information is a necessary part of scholarship, and unfortunately the part most likely to be tested on examinations, especially those wretched ones called "objective examinations" where the truth is always supposed to lie in answer space A, B, C, D, or E, but never apparently in X, Y, or Z. But the curiosity we expect of you cannot be satisfied by passing examinations or by memorizing other people's answers to other people's questions. We do not wish to put you through a mere course of mental gymnastics. We want you to be content with nothing less than the whole truth about the subject that interests you. Which means that we want you to be forever discontent with how little you know about it and with how little we know about it. We want you to back us into corners, show us up, make us confess we don't know. Does this sound formidable? It is not. We may tell you what we know with great assurance, but push us and you will find the gaps.

Follow your own minds into the gaps. Follow your minds where curiosity takes them. You will not get the whole truth, not about protons, not about the structure of a poem, not even about a Roman coin. Nobody does. But if you learn anything, it ought to change your minds, and hopefully it will change ours too. It will be a sign that we have both wasted four years if you leave here thinking pretty much the same way that you do now or if you leave us thinking the same way we do now.

We expect of you, then, that you will be curious for the truth. We also expect that you communicate whatever truth you find, and that you do it both in speech and in writing. Many people suppose that they know something if they can stammer out an approximation of what they mean in speech. They are mistaken. It is extremely unlikely that you have thought clearly if you cannot express yourself clearly, especially in writing. Writing is more than an instrument of communication. It is an instrument of thought. You should have acquired some competence in its use by now. I suspect from past experience that you have not. But even if you have, you have a great deal more to learn about it. And if you do not know much more about it four years from now, it will again be a sign that we have failed in part of our job, the job of making you communicate clearly.

Communication is a two-way process, and a university is a community of scholars, where questions are asked and the answers communicated, your answers to us, ours to you. For the next four years we will be engaged as scholars together in this community. After the four years are over, most of you will leave Yale, but if our community is a successful one, if we really do communicate with each other, I believe that you will continue to be in some sense scholars, asking new questions, looking for new answers, and communicating them to the world.

We reprinted the above article by Professor Morgan because it explains so thoroughly our own heretical point of view. If mere curiosity about an unexplained phenomenon is sufficient reason for inquiry, then we are justified. If you grant the existence of a single periodic fluctuation then you in turn grant us the right to ask when and where and how and why.

The basic research program is gradually getting up some steam. The first project which is a direct result of the program is reported on in this issue in the lead article.

To find out the cause of a cycle we need to find out what else in nature fluctuates with *identical* wave length. To make sure the wave length is identical (as nearly as may be), we need very exact measurements. For this purpose monthly figures are twelve times as good as annual figures; weekly figures are 52 times as good, daily figures 365 times as good. You can't get daily figures of rabbit abundance, but you can get *daily* figures of stock prices from January 1st 1879 to date—63 years, 23,010 days! This gives us 192 repetitions of a cycle, say 17.12 weeks long. With data of this sort we can measure length down to 1/200th of a day, or closer. This is close enough to give us information we need. And, incidentally, to give you something *you* want! We expect to lean heavily on stock market figures in connection with the Program. See the short report on page 103 of this issue about the current status of our work with the 17-plus week cycle in stock prices.

If the National Science Foundation will provide the necessary money for the trip, I plan to attend the 7th International Conference of the Society of Biological Rhythm at Siena, Italy, September 5-7, 1960, and to present a paper.

While I am on the other side of the water I plan to buzz about to visit with members, contributors, and scientists.

If you know people in Britain or on the Continent to whom you would care to give me letters of introduction, I can assure you that they will be appreciated.

Cordially yours

Edward R. Dewey

Director

Research by Staff

SUNSPOTS AND WAR, 300 B.C. TO DATE

By Edward R. Dewey

Summary

The first study undertaken by our new Basic Research Program attempted to answer the question "Are sunspots associated with war and other sorts of mass human excitability?"

The answer is, "Yes, to a limited extent."

It then attempted to answer the question "Do sunspots cause *mass human excitability?*

The answer is "No, because the waves of mass human excitability come before *the corresponding sunspot waves!"*

What is the explanation of this seeming contradiction? The answer may lie in the existence of forces that are common to both earth and sun. These forces may affect the areas toward the poles before they affect the areas toward the equator. Mass human excitability concentrates in the area about plus or minus 38° of latitude. Sunspots concentrate in the area about plus or minus 20° of latitude—18° nearer the equator. Consequently, a cyclic force passing simultaneously over the surface of both earth and sun would influence human actions, then influence sunspots. This is what we find.

It is a favorite bit of folklore that sunspots cause war and other sorts of mass human excitability.

"A blemish on yon shining orb
Doth portend evil to mankind."

An investigation of this sort is particularly timely, as sunspots are now decreasing in numbers. Does this fact auger well for a decrease in international tensions? And will tensions increase from 1965 to 1969 when sunspots will again be on the rise?

Support to the idea of some sort of an association between sunspots and war and other sorts of mass human excitement is lent by the studies made in Germany in 1938 by the Düll̈s. As I told you in *Cycles* for February, 1960, these studies show that there is a marked increase in insanity, suicide, and the like on days of solar eruptions. Support on this idea of association is also lent by a study of A. L. Tchijevsky (published in *Cycles* for February 1957) which records mass human excitement, 500 B.C. to 1922 and compares it with dates of sunspot maxima over the centuries. As a result of his studies Tchijevsky concluded that sunspots are indeed the cause of periods of mass human excitability.

What are the facts?

The results of our investigations are reported upon in full in the *Journal of Cycle Research* for January 1960. The following is a brief summary of that article.

First of all come the questions: How are you going to measure mass human excitability? How are you going to measure sun spottiness?

To answer the first question, we decided to use Tchijevsky's Index of Mass Human Excitability 500 B.C. — A.D. 1922. We could have used Wheeler's Index of International Battles, or Wheeler's Index of Civil War Battles, or a combination of the two. When time permits we have in mind to do the study over again using Wheeler's indexes instead of Techijevsky's to see if we get the same results.

To measure sun spottiness we decided to use Schove's data of sunspot maxima 300 B.C. to date. Schove's data of sunspot maxima are really the only good series of dates available. Actual year-by-year counts of sunspot numbers are available back only to 1749; telescopic observations back only to 1610. Before that time you must rely upon estimates of years of maximum spots. Doubtless in many instances these estimates are in error by a year or two one way or the other, but these errors tend to wash out. On the whole, therefore, Schove's estimates would seem to be adequate for our purposes. At all events, they are the best we have.

We went at the study in two ways: First, we compared the dates of the crests or peaks of the Tchijevsky index with Schove's dates of sunspot maxima. Second, we compared the year-by-year values of the Tchijevsky index with Schove's dates of maximum.

When we first compared the peaks of mass human excitability with the peaks of sunspot activity (sunspot maxima) we found no more correspondence than you would find by chance. However, when we compared the peaks of mass human excitability with the peaks of sunspot activity *set back a year*, there was reasonably good correspondence; if we set the sunspot peaks back by two years the correspondence was even better. There is definite evidence that the peaks of mass human excitability tend to cluster about a time a year and a half *ahead* of sunspot maxima.

The same results were obtained when we compared the year-by-year values of the Tchijevsky index with the data of sunspot maxima. There was a definite tendency for mass human excitement to *precede* the peaks of the sunspot cycle.

What could be the cause of behavior of this sort?

When, in 1937, Garcia Mata and Shaffner noticed that peaks of sunspots *followed* peaks of business, they concluded that it was the *rate of increase* of sunspots that had terrestrial repercussions, rather than the absolute number of spots. This may of course be so, but the phenomenon of latitudinal passage was not known at that time. Latitudinal passage would seem to be the more reasonable explanation.

Readers of these pages hardly need to be told that latitudinal passage is the tendency for cyclic peaks (and of course the corresponding troughs) to come later and later as the cycles manifest themselves nearer and nearer to the equator. This behavior is a universal characteristic of cycles in so far as the phenomenon has been studied. The slippage has been found to be about 7/10 of the length of the cycle for the entire 90° from pole to equator. That is, according to what is known, a 10-year cycle that crested at the poles in 1950 would crest at the equator 7 years later in 1957. Halfway from pole to equator it would crest halfway between, or at 1953.5.

As the mass human excitability data seem to concentrate at about 38° North and South latitude, and as the sunspots concentrate at about 20° North and South latitude, we would expect that the earthly events involved would precede the solar events. In fact, as the sunspot cycle is about 11.1 years long and as there is about 18° difference in latitude between the phenomena, one would expect the earthly events to come 18/90 of 7/10 of 11.1 years or 1.5 years earlier. And they do!

Two more facts that were brought out by this study need to be called to your attention.

First, the association of mass human excitability with sunspots, no matter what the cause, accounts for only a small part of the fluctuation of the mass human excitability index. The so-called 11-year waves of the mass human excitability index fluctuate between an average of 0 at times of trough to an average of 8 at times of crest, an overall range of 8. That part of the index that may be thought of as corresponding to or associated with sunspot behavior fluctuated between 3.3 and 4.4. This is a range of only 1.1 — only 14% of what would be possible if all of the mass excitement waves were timed entirely by sunspot association. Other cyclic forces, or random forces, account for the other 86% of mass human excitability fluctuations.

The second supplemental fact to be observed is that the mass excitement crests do not precede the sunspot maxima by constant amounts as we observe them over the 2,200 years of behavior covered by our study. In fact, the mass human excitability index behaves as if it were simultaneously influenced by another cyclic force about 1/10 of a year longer than the sunspot cycle, Such a cycle, starting out together with the sunspot cycle will pull ahead about 9/10 of a year per century or nine years every thousand years. This will put it back into step with the sunspot cycle in about 1200 years. This second cycle is the stronger of the two. I originally found it in Wheeler's Index of International Battles, 1750 to 1950 (See *Cycles* for February 1951). It is interesting to find that in Tchijevsky's Index it goes all the way back to 300 B.C.

What does all of this add up to? Like everything else in this world the answer is neither black nor white, but grey. If we admit the substantial accuracy of the Schove and the Tchijevsky indexes, there does indeed seem to be a correspondence between sunspot maxima and mass human excitement. Only, clearly, the human index crests first. Sunspots, as such, cannot reasonably be the *cause* of the behavior, because they crest *after* the earthly events. But, if latitudinal passage characterizes this cycle, there could be a force that affects both human beings *and* sunspots simultaneously.

The situation is far from being as simple as this brief summary suggests. At least one other cycle of closely related wave length affects mass human excitability. And how many other cycles may be present in sunspot numbers can be only guessed at.

The net of it would seem to be that this study provides another bit of evidence to show that at least some cycles are not chance phenomena, to link terrestrial and solar cycles, and to suggest that the origin of cycles lies outside the earth.

THE "17—WEEK" CYCLE IN STOCK PRICES

Our current Basic Research project has to do with the so-called 17-week cycle in stock prices.

We chose this cycle because we have very good reason to believe that it is a "real" (that is, significant) cycle, and not merely chance behavior.

We chose to study it in stock prices because weekly figures are available and, if necessary, daily figures. For this same reason we chose Dow Jones Industrials, January 1, 1897 to date with which to work.

The work done so far shows that this cycle in stock prices *is* present on the average from 1928 on back to 1897. This fact adds support to our conviction that this cycle is significant and that it is forced by something external to the stock market itself.

Weekly figures permit very accurate determination of wave length. Work done so far suggests that the length is slightly longer than the 17.12 weeks determined previously in the 1928—1959 figures. Over the whole period of time the length seems to be about a quarter of a day longer. This makes the length about 17.17 weeks.

If further study confirms this length, it will prove that this cycle is *not* related to the length of time it takes Venus to go around the sun, as some have supposed, and that it is *not* a fraction of the 17.75-year cycle, unless the 17.75-year cycle is slightly *over* 17.75 years (present indications are that the true length of the so-called 17.75-year cycle is slightly *under* 17.75 years).

You will hear more about this work soon. I will keep you posted because I know you will want to put anything we learn to immediate use. *E.R.D.*

ULTRA-LONG WAVES AND SOLAR TERRESTRIAL RELATIONSHIPS

(Condensed from a paper in the *Journal of Cycle Research*)

By Leonard W. Wing

Although it has been long known that sunspots have a cyclic pattern, the nature and behavior of sunspot cycles is still neither well known nor well understood. This paradox stems from a number of factors besides lack of research. The usual lag of understanding of any behavior behind the awareness of its existance may be expected as a normal thing. Yet in the case of sunspot cycles—astrophysical events of great magnitude—lack of understanding can hardly be attributed entirely to the usual time lag.

Several factors and conditions seem to have acted in concert to inhibit rapid investigation and understanding of the nature of sunspot cycles. One is the common human trait of seizing upon new discoveries and applying them rather prematurely to many currently unexplained happenings.

Sunspot research surely has had more than its measure of suspicion and skepticism, much of which seems hardly warranted. An event of such magnitude as the coming and going of sunspots is too great to pass off merely because we are inadequate for the time being in understanding what really goes on before our eyes. The skepticism of the past few decades has about run its course, largely perhaps because scientific effort has turned to other and seemingly more promising endeavors, leaving the field of sunspot cycles, solar-terrestrial relations, and other cycle research to more deliberate studies. This seems to follow the general pattern of many scientific discoveries; after the flurry of newness wears off, the laborious work of research is left to the few willing to work where rewards in quantity seem to be remote at best.

It appears also that a rather large superstructure of application and explanation was built too soon upon the rather small foundation of the laborious and time consuming research into the nature of cycles.

Another pitfall, I think, has been the belief that some one cycle of widely varying length is responsible for the "11-year cycle," or the "sunspot cycle." The "11-year cycle" is actually a manifest of many cycles, of many wave lengths, each contributing according to its amplitude, timing and phase, the whole dominated by a particularly strong wave of about 11-years wave length. They act somewhat as though oscillating about the eleven-year dominant. This keeps the dominant wave from expressing clearly its own timing and amplitude.

An important development is the recognition that these rhythms are *waves* that differ from previously recognized waves only by their very great wave length. In turn, their frequency is very low. These are termed *ultra-long* waves.

Failure to recognize the wave nature of rhythmic cycles accounts for the belief that cycles may vary in wave length from epoch to epoch. Actually, variation from a constant length characterizes any time series that results from more than one wave. This can be demonstrated in created data. If waves are not systematically related to each other, their combination in turn will not carry a systematic appearance. The turning points of the combination will appear random with respect to each other.

Another difficulty is that strong response of any natural event to any wave length varies. By anaolgy to color, which shows strongly according to the pigment or structure of the reflecting or transmitting agent, I have termed this habit of different response according to wave length a *pygmatic effect*. The *pygmatics* of the phenomenon are the basis of this response to some wave length more than to others.

Because we do not know as yet the nature of the generating waves themselves, we have in turn no knowledge of any variation in them that events may reflect. Two or more events may show strong response to the same wave. Yet the fact that one event does show strong response to a wave is no reason to expect that any other event may show a similar response. The response pattern of any phenomenon seems dictated by its pygmatics. Each seems to have its own set of pygmatics; hence, each acts independently of others.

It is clear, nevertheless, that some indefiniteness occurs in considering *phenomena*. The small rodents of Norway, for example, show the same 3.862-year cycle as do the lemmings, which are but one species of rodent. In this case, it appears that the species itself is but a part of the whole phenomenon, the whole being the small rodents as a group rather than each species by itself. It may be, however, that the more nearly alike, the more nearly do events have strong response to the same wave. The pygmatics thus may be similar in closely related things.

Yet analysis does show that, with a very long record, cycles found in one phenomenon may be present in related and sometimes seemingly unrelated phenomena. Cycles found in animal numbers, sunspots, and temperature, for example, have been found also in long records of tree-ring measurements.

Among terrestrial happenings, biological data appear to show high response to particular wave lengths more than do non-biological ones. People concerned with animals in the field have been aware of this longer than most others, if we may judge by the long history of commenting upon it. Locust plagues, for example, were a very ancient, cyclic, biological behavior of great amplitude. Outbreaks of lemmings have been known so long in the Scandinavian region that they have become part of the folk tales and legends of the people.

Our concerted work using many phenomena of wide distribution is a necessary step in the study of the nature and behavior of ultra-long waves, and of solar-terrestrial cycle relationships.

THE ONE-YEAR PATTERN OF CHANGE IN STOCK PRICES

By G. Shirk

If the behavior of stock prices at the present time conforms to the average past behavior of the cycle developed by the one-year pattern of change in stock prices, then the present decline is not yet over, and we may expect at least several additional months to pass before a definite upturn develops.

This opinion is based on only one facet of only one of the cycle studies of the stock market on which we are currently working. However, if you follow the discussion which follows, you may agree that this conclusion is reasonable.

It is not possible using only this one tool to decide how long the decline may last; or how low the market may go—but it does appear that more decline, or at least a sideways move, is a more reasonable expectation than an immediate upturn.

In addition, I trust the discussion is explicit enough so that you can reach your own conclusion—just in case you may decide to disagree!

The figures used in this work are the monthly averages of the daily close of the Dow-Jones Industrial average. These figures are shown on the chart below as the thin line, only as background for the per cent curve.

The heavy line on the chart is a one-year per cent curve. This represents the one-year change, month by month. That is, the value for January of each year is divided by the value for January of the preceding year, and the result multiplied by 100. The value for February is divided by the value for February of the preceding year, and so on for all the months of all the years. Thus, you can say that the value of the Dow-Jones Industrial average for January 1960 was 110.7% of the value for January 1959.

The particular reason for making this computation is that it eliminates any 12-month cycle, and at the same time emphasizes any 41-month cycle that might be present. Our interest here is in the 41-month cycle, and this is discussed later in this article. For a discussion of the use of moving percentages see the "Cycle Workshop" on page 110 of this issue.

Although we do not yet have the solution to the problem of the 41-month cycle, in the meantime this per cent curve may be useful as a general tool in the problem of analysing the market.

One particularly useful point—a per cent change chart of this type frequently turns *ahead* of the figures on which it is based. This has been pointed out in previous articles on the subject.

The Dow-Jones per cent chart reached a peak in April 1959. Of course the curve can and does bounce around, and a possible turn is not a certain signal of a coming turn in the basic figures.

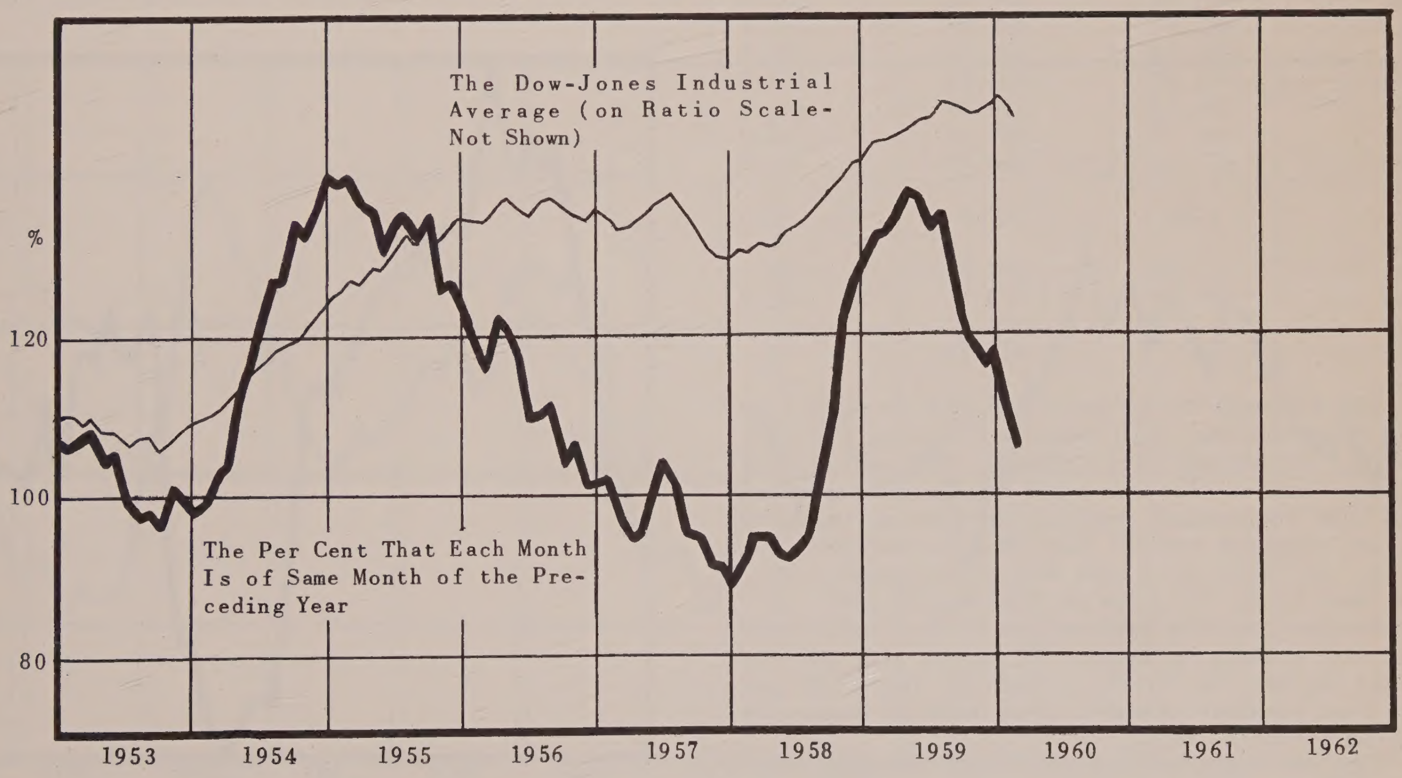


FIG. 1 THE DOW-JONES INDUSTRIAL AVERAGE - ONE YEAR PER CENT CURVE

But considering the dangerously high level of the market (as pointed out frequently) and the fact that once the April peak was passed, the slide down from the peak has been almost continuous, one was put on notice that although the market was reaching new peaks, the increase was slackening, month by month, long before the January break.

In the past, once a peak has been reached on this curve, the cycle as expressed by the per cent change, has, on the average, continued down for about 20 months. Of course this is the down-leg of the 41-month cycle. The length of time covered by this downward slope is an *average* figure. The actual time covered by the downward slope has been as short as eight months (1903) and as long as 39 months (1950-53). As the curve develops from month to month you can reach your own conclusions about what it is going to do this time. (It will be very helpful when we have a satisfactory explanation of the 41-month cycle, as we will then have a more reliable idea of what to expect.)

The month by month computation necessary to extend this curve is very simple. The figures beginning January 1959 follow.

Dow-Jones Industrial Average
Monthly Average of Daily Close

	1959	1958	%
Jan	592.29	445.68	132.9
Feb	590.72	444.16	133.0
Mar	609.12	450.14	135.3
Apr	616.99	446.90	138.1
May	630.80	460.04	137.1
Jun	631.51	471.97	133.8
Jul	662.81	488.28	135.7
Aug	660.58	507.55	130.2
Sep	635.47	521.82	121.8
Oct	637.34	539.85	118.1
Nov	646.43	557.10	116.0
Dec	671.35	566.43	118.5

	1960	1959	%
Jan	655.39	592.29	110.7
Feb	625.38	590.72	105.9
Mar		609.12	
Apr	?	616.99	?

The 41-month cycle was discussed in detail in the March and May 1954 issues of *Cycles*. The reason why we are not more definite about this cycle at this time is that the cycle may have disappeared and then reappeared, but upside-down in relation to its previous timing. According to the previous work, an ideal peak was due at November 1956, followed by an ideal low at July-August 1958.

Another possible explanation is that this cycle may have a changing length. We cannot give answers until we are ourselves satisfied that they are the best possible answers. More work is necessary on the 41-month length.

In the meantime you may find the one-year per cent change idea a useful one.

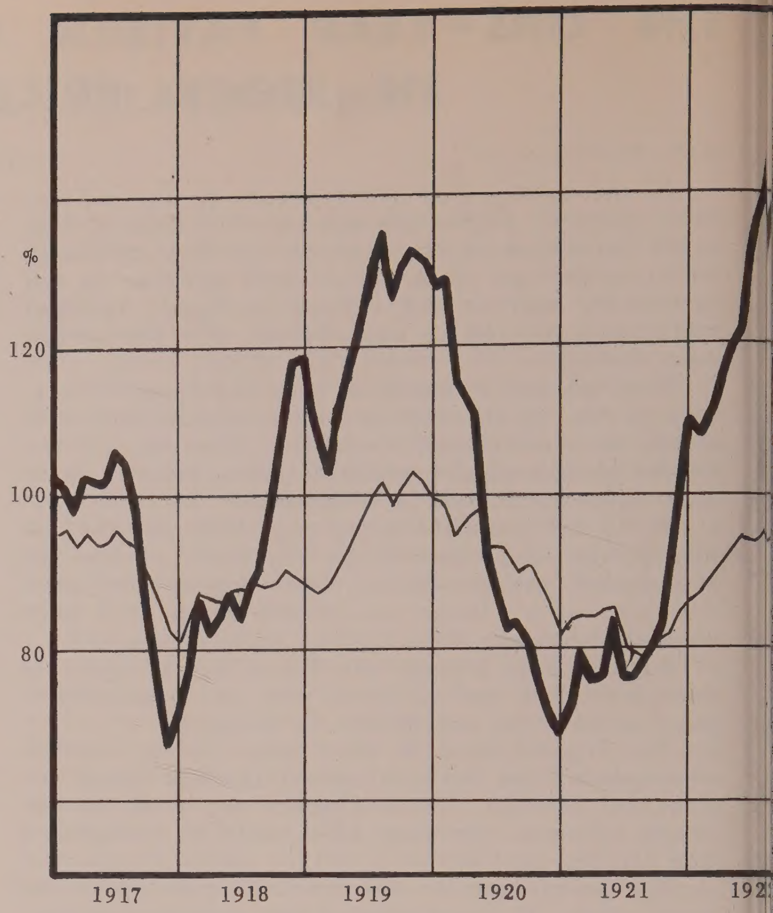


FIG. 2 THE DOW-JONES INDUSTRIAL AVERAGE

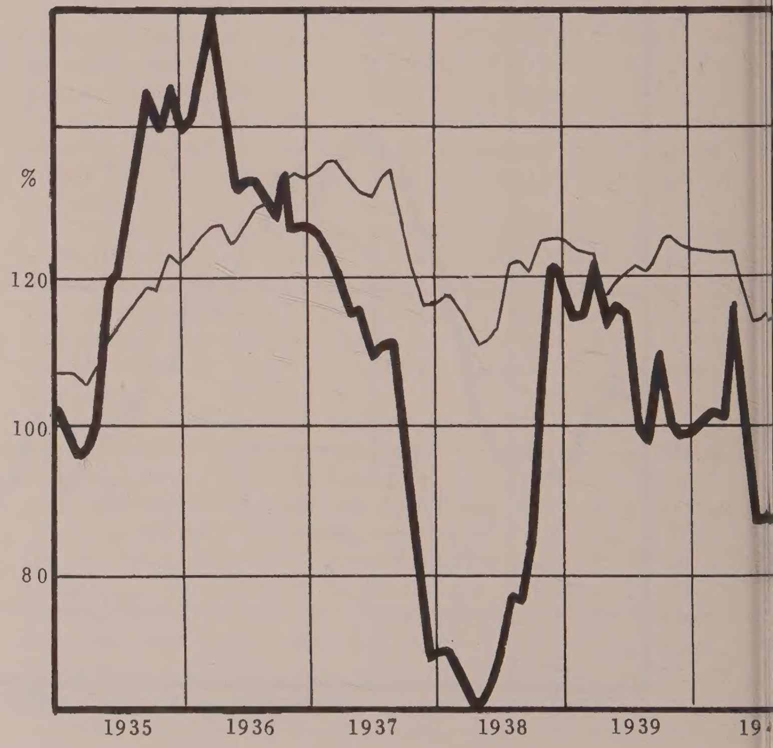
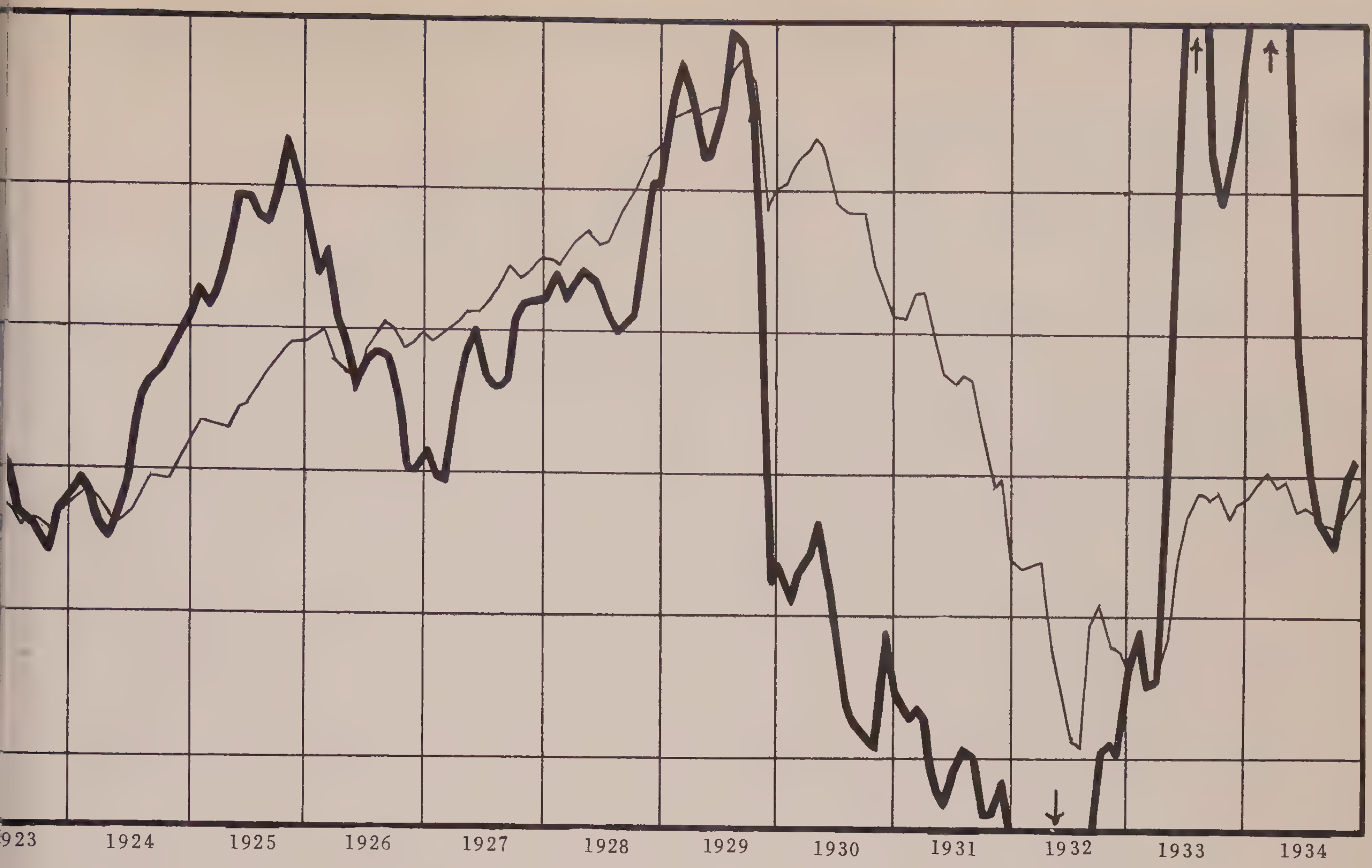
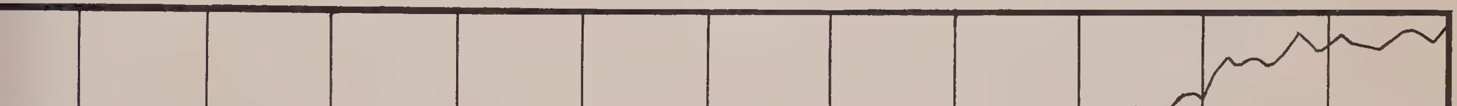


FIG. 2 THE DOW-JONES INDUSTRIAL AVERAG



ONE YEAR PER CENT CURVE



ONE YEAR PER CENT CURVE

Research by Others

THE EFFECT OF LIGHT ON THE LIFE CYCLE OF INSECTS

Editor's Note: This article is a report on the work of Professor Stanley D. Beck of the Department of Entomology of the University of Wisconsin. His work is chiefly with insect nutrition and metabolism. Professor Beck wrote of his work and the work of other entomologists in the article "Insects and the Length of Day."

If you are an amateur gardener, have you ever wondered how those bugs know so much? Many scientists have also wondered the same thing. For it is a fact that insects know that winter is coming, and get ready for it, even though the September sun is still a hot summer sun. Insects, plants and animals all exhibit this adjustment to a coming season long before the season arrives.

How do they know? Biologists believe that insects respond to the changing amount of daylight, and much evidence has been accumulated to demonstrate this response. Their present concern is with how the stimulus is received by the insect, and what physical reaction is started that changes the life process so drastically.

Some insects are short-day insects and behave normally so long as the days are short. Makita Kogure of Kyushu University in Japan published in 1933 a study of the life cycle of the silkworm which showed that the silkworm is normally a short-day insect.

The silkworm goes continuously through its life cycle of egg, worm, cocoon, moth, egg, worm, cocoon, moth without interruption so long as the days are short (12 hours). When the days become longer, the normal cycle is interrupted and the adult moth lays eggs which, instead of developing immediately into worms, become dormant. It was found that the daylight to which the eggs and young larvae of the preceding generation were exposed determined whether the eggs of the next generation would become dormant or not.

It was learned that the influence of a hormone produced in the head of the female silkworm larvae had an arresting effect on the eggs of the next generation. Thus the species survives the winter as an egg.

Some insects, such as the European corn borer, are long-day insects. Generation succeeds generation with no pause for dormancy so long as the days are long (16 hours) according to Stanley D. Beck of the University of Wisconsin. The European corn borer passes the winter as a mature larva rather than as an egg. It becomes dormant when daylight is only 10 to 13.5 hours long. The corn borer is also sensitive to temperature, with high temperature inhibiting dormancy, and low temperatures increasing it. In the summer in the south where days are shorter than in more northern latitudes, the higher temperatures more than compensate for the shorter day.

Thousands of species of insects exhibit a life cycle which proceeds in direct response to external stimuli. Apparently, development is controlled by a hormone, identified as ecdysone by V. B. Wigglesworth of the University of Cambridge and Carroll M. Williams of Harvard. Dormant insects contain no detectable amounts of this substance but when injected with it, they resume normal development.

It may be that the change in the day length in some way causes the production of this hormone to stop. How this is done is a basic biological question. There may be other hormones involved, but the problem remains one of developing the explanation of the manner in which the insect responds to light.

For instance, it is probably not a photochemical reaction because the intensity of light seems to make little difference—it seems to be the duration of light that is important. If a very small scale photo-chemical response to any light does trigger the response, then it is the change from dark to light and light to dark that is the stimulus. This would be like a switch being turned on and off to activate a built-in clock, which, of course, still does not explain how the insect knows that the length of time the switch is on has changed.

Biologists are looking for an explanation of the mechanism that "times" the day for insects, or the biological clock, as it is called.

An insect, to measure light and darkness, must have a special light-receptor, but it appears that all parts of the insect body are equally receptive to light. Shielding the eyes, and other parts of an insect, indicates that all parts of the insect are receptive to the information about the day length.

From the point of view of cycles, the life cycle of an insect is a simple thing, but an answer to the problem of the mechanism by which an insect responds biologically to an external stimuli may be one of the clues we are looking for in the larger problem of cycles. *G.S.*

Library Additions

DYNAMIC SYMMETRY

Dynamic Symmetry: The Greek Vase by Jay Hambridge. Yale University Press. 1920. 161 pages.

We have, from time to time, mentioned the logarithmic spiral, or Fibonacci series, as a possible clue to the relation of cycles, or the variation in cycles of varying length. According to this pattern of behavior, to put it simply, a series increases so that each succeeding form of the starting item is 1.618 times the original, or so that each succeeding number is the sum of the previous two. (*Cycles*, February 1955, page 48, and *Cycles*, December, 1957, page 315.)

This subject is rather on the edge of the study of cycles, not in the middle. It has to do with pattern and form and structure. The pattern is found throughout nature, in shells, and leaf design, for instance.

This book is an analysis of the use of this pattern in the design of Greek vases. Presumably, the Greek applied the logarithmic pattern to the relationship between the size of the areas used in parts of a vase. That is, for a given height and shape, a vase would automatically have a certain width. Handles would be of a certain size, and placed in a particular spot determined by the logarithmic pattern.

Although not directly about cycles, this is a book that fascinates as it traces the way an artistically true pattern is built up consciously by a mathematician, or unconsciously by a good artist.

RATS

Lasting After-Effects Produced in Rats by Several Commonly Used Drugs and Hormones. An article by Curt P. Richter. Reprinted from the *Proceedings of the National Academy of Sciences,* Vol. 45, No. 7, July 1959.

This article is a report of the after effects of the administration of drugs to rats. The writer points out that although undesirable side effects of new therapeutic drugs get much attention, "The possibility that. . .some of the commonly used drugs and hormones may be followed by serious and permanent pathological after-effects has not received much, if any, attention."

The pathological after-effects measured in the experiments described were revealed in the appearance of regular, but abnormal cycles in the spontaneous running activity in revolving drums, food and water intake, and reproductive processes.

The mechanisms underlying the creation of these abnormal cycles is unknown, in rats and in people—instances of regular abnormal cycles in behavior, mood, and metabolism, appearing in man after the end of prolonged treatment having been observed also.

Dr. Richter points out that the evidence of a lasting effect produced by drugs on laboratory rats does warrant a recommendation that medical researchers look for permanent pathological after-effects from drugs as well as concomitant side-effects.

* * *

Periodic Phenomena and the Thyroid. An article by Curt P. Richter, et al. Reprinted from the A. M. A. *Archives of Neurology and Psychiatry,* Vol. 81, February 1959.

This is a report of "Abnormal But Regular Cycles Produced in Rats by Partial Radiothyroidectomy." The thyroids of 16 rats were partially destroyed by radioactive iodine. Of the 16 rats, 8 developed abnormal but regular cycles. The cycle was shown by the presence of inactive phases, lasting 13-14 days. This inactive phase of the cycle had the same length throughout all the cycles in any one rat, and was the same in all of the 8 rats that developed cycles.

However, the active phases of the cycle were longer, then became shorter with the passage of several cycles.

The abnormal cycles disappeared when the rats were treated for thyroid deficiency. When the treatment stopped, the cycles returned.

The authors point out, "That the abnormal cycles of activity or metabolism closely resemble some of the cycles seen in catatonic schizophrenics, since they have the same length and other characteristics and since both respond to thyroid replacement therapy, and also that they resemble some of the cycles of patients with periodic illness.

AURORAE

Chinese Aurorae: I, A.D. 1048—1070. An article by Dr. D. J. Schove of St. David's College, Beckenham, Kent, and Dr. P. Y. Ho of the Department of Physics, University of Malaya, Singapore. Reprinted from the *Journal* of the British Astronomical Association. Vol. 69, No. 6/8, pp/ 295—304.

In our work on sunspot cycles we have used the dating for early sunspot maxima as determined by Dr. D. Justine Schove. Schove worked out as best he could the times of maxima from old records and chronicles of aurorae. In this type of historical work there are areas of doubt where the records are incomplete. Schove postulated a single maximum occurring during the 29 year period between 1038 and 1067, although he also pointed out the possibility of two maxima having occurred in this interval.

This article presents the translation from the Chinese of hitherto unavailable records of aurorae which support the 1052 date for a sunspot maximum. The translations from the Chinese are by Dr. Ho.

The new source is the Official History of the Sung Dynasty (A.D. 993—1279), known as the Sung Shih. Those records relevant to the doubtful period are presented and discussed by Dr. Schove.

The Cycle Workshop

MOVING PERCENTAGES

By G. Shirk

Recent articles in the Cycle Workshop have discussed various methods of detecting cycles and have started to get into the subject of moving averages and deviations.

In this article we want to digress a little and talk about moving percentages such as were used in the article on stock prices on page 105 of this issue. This technique of moving percentages can be used to detect cycles. Although the cycle as expressed in moving percentages will have a different shape and timing than the cycle in the basic figures, it is a simple way of checking in uncertain cases whether a given cycle may be present.

In that article, 12-month moving percentages of the basic data were plotted to see if a 41-month cycle were present. It was stated that a 12-month moving percentage would emphasize any 41-month cycle, and at the same time, eliminate any 12-month cycle that might be present.

A demonstration of this process is given on the charts. Figure 1 shows a 12-month cycle, a 41-month cycle, and the combination of the two. The figures are just made up to illustrate the process, but the amplitude of the 41-month cycle is so large that the 12-month cycle can be seen on the combination only by careful inspection. The 41-month cycle can be seen easily.

Figure 2 shows a 12-month percent curve of the combined 41- and 12-month cycles. The evidence of the 12 that did show through on the original combined figures can no longer be seen, and the 41-month cycle appears clearly, although it is of different shape and timing than the original.

If the 41-month cycle had been so weak that it had not been visible by inspection the 12-month

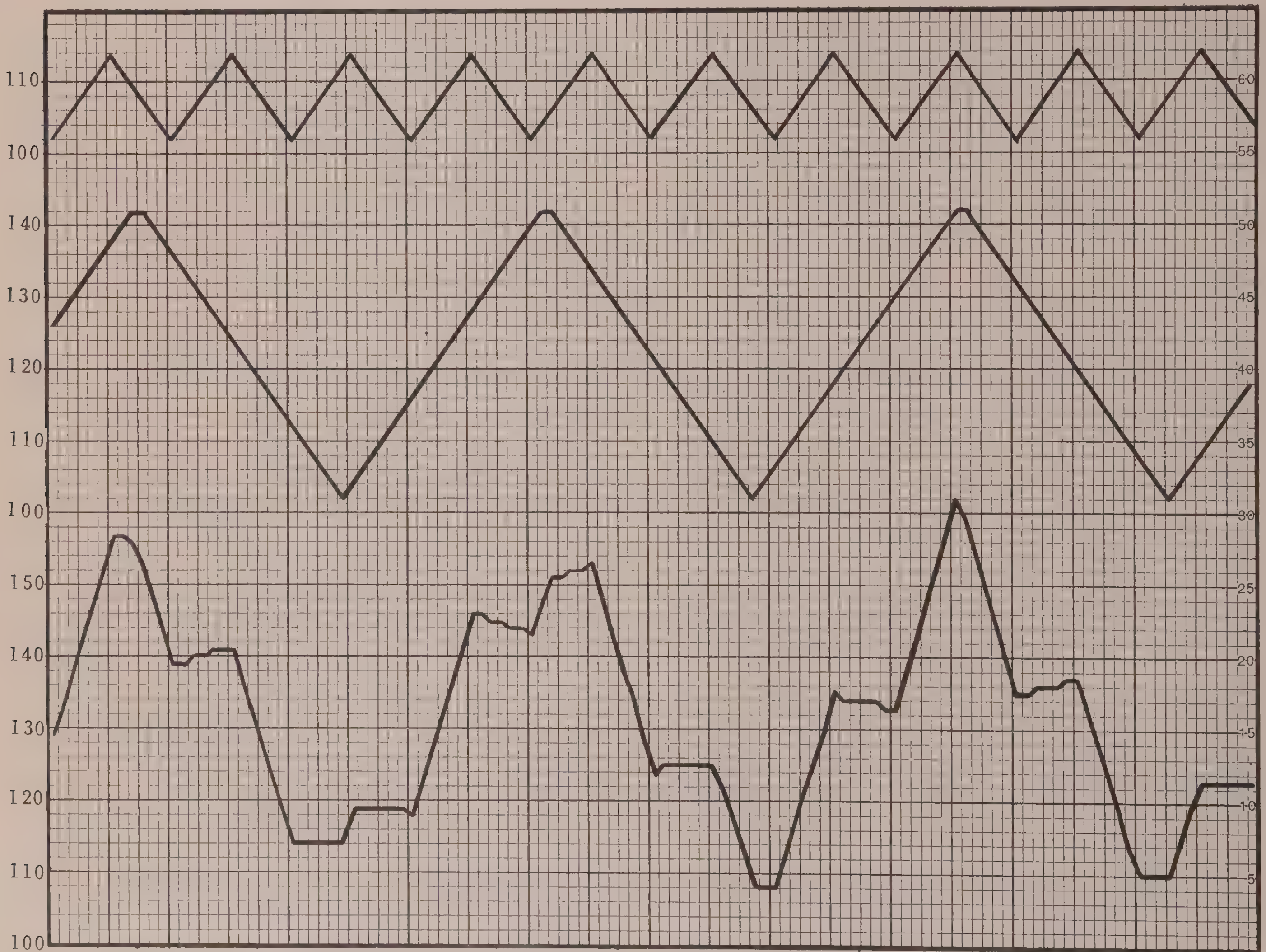


FIG. 1 COMBINATION OF A 12- AND A 41-MONTH CYCLE

moving percentage would have revealed it, as will be illustrated in another article.

Moving percentages of any length are easily computed. A 12-month moving percentage, such as was used in the stock price article, is computed simply by dividing each monthly value by the value for the month 12 months before. A 20-month moving percentage would be computed by dividing each monthly value by the value for the month 20 months before.

The selection of the length to use is determined by certain properties of moving percentages. First, a moving percentage of a given length will completely eliminate any cycle of the same length, and also it will eliminate any cycle which is 1/2, 1/3, 1/4, 1/5, etc. of that length. Thus the 12-month moving percentage which we used on the stock figures not only eliminated any 12-month cycle, but also any 6-month, or 4-month, or 3-month, or 2-month cycle that might be in the figures. By eliminate we mean that the evidence of it is removed from the figures so that in inspecting the result our observation is not clouded by lengths in which we are not at the moment interested.

Also, it follows that if in a series of figures you wish to eliminate any possible 41-month cycle, a 41-month moving percentage will do it.

At the same time as a given moving percentage is eliminating so many cycles from consideration, it is also emphasizing others. A moving percentage doubles the amplitude of any cycle which is twice its length, or 2/3, 2/5, 2/7, 2/9, etc., of its length, provided the cycle is symmetrical.

Thus, in a simple combination like the one used here if you had a *very* strong 41-month cycle, and wanted to know if a seasonal, or 12-month cycle were present, you could check it out quickly by using a 41-month moving percentage for a few years. This would eliminate the 41-month wave and emphasize a 12-month wave. Two-sevenths of 41-months is 11.7 months, or *almost* 12, and you could see if a 12 is present. The moving percentage will not show the cycle as it actually exists in the original figures, but before you go to the trouble of working out a moving average and deviations to look for a seasonal that might not be present, this technique can be used as a check.

Figure 3 shows five years of the illustration and diagrams a 41-month moving percentage. Evidence like this would justify one in spending the time to isolate the seasonal. It took only 12 minutes to make the computations necessary to get the figures for the line on Figure 3.

This is a simple demonstration of a type of analysis that is really more complicated than I have indicated. It is something to keep in mind for use when two possible cycles are clouding the picture. Situations involving several cycles gets one into more complicated filtering.

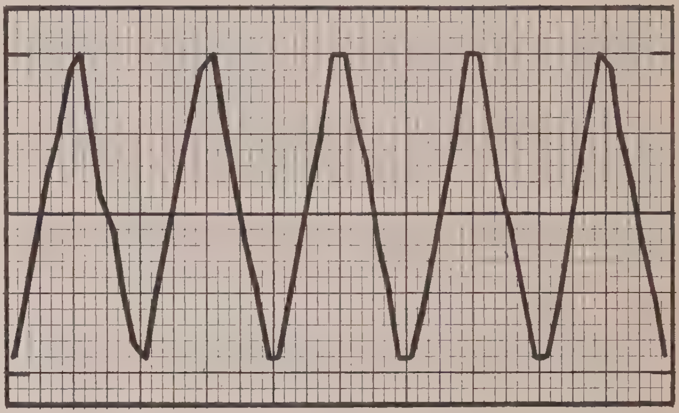


FIG. 3 THE 41-MONTH PER CENT CURVE OF THE COMBINED 12- AND 41-MONTH CYCLES

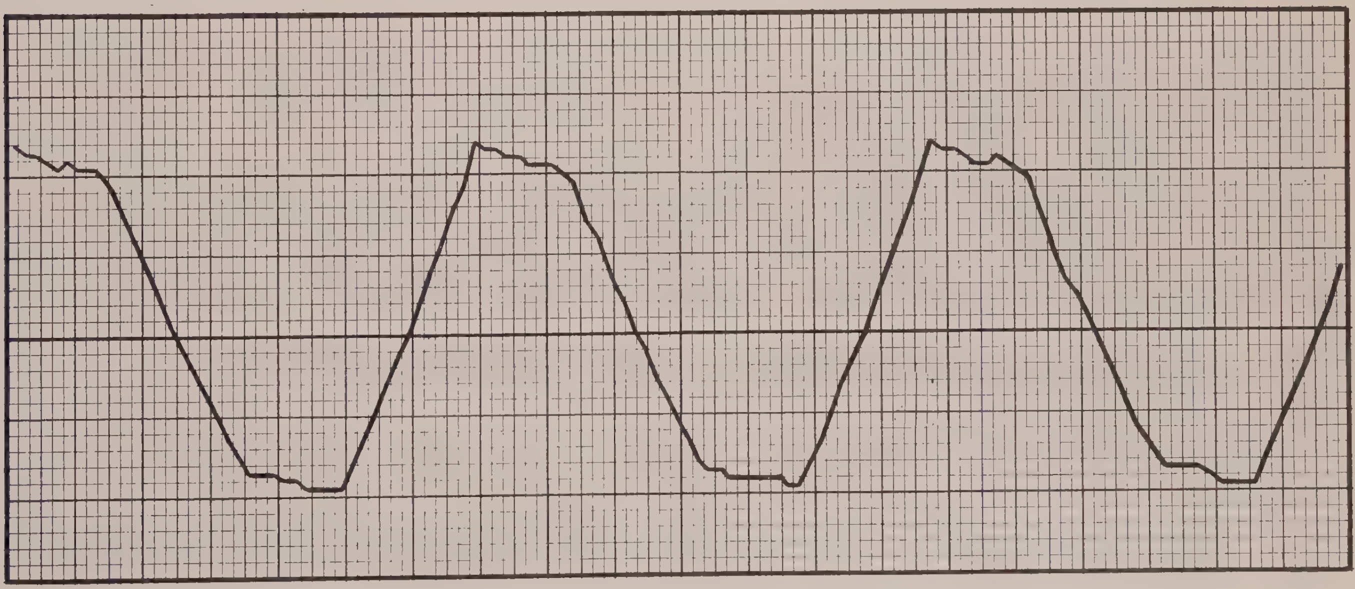


FIG. 2 THE 12-MONTH PER CENT CURVE OF THE COMBINED 12- AND 41-MONTH CYCLES

Letters

RUSSIA

Dear Mr. Dewey:

I think you were unfair in your comments about Russia, and your attitude indicates you do not understand the declared intentions and ultimate aims of the Communists. To destroy us and all we stand for.

You say it is almost impossible to read anything about the Russians that is not slanted disparagingly. I disagree emphatically.

Their Ballet and dancing groups, and Olympic teams have been wildly acclaimed here.

A group of prominent engineers representing our electrical industry made a survey last summer of Russian power installations and practices. There was a discussion of their findings in a recent *Electrical World*. It was not disparaging even though they do not agree with your opinion that Russia will surpass us industrially in 25 years.

Comparisons are odious at times, but they are still necessary for accurate perspective. Sonia's clothes reflect her standard of living, and a comparison of her clothes and Mabel's over here gives us an idea of whose standard of living may be better. There is little doubt as to whose clothes would be selected if the choice were left to Sonia or Mabel.

The same is true of general living conditions such as housing, food, transportation and public services. Should we regress to Russian standards?

Mr. Khrushchev brags insultingly about his Sputniks and what he intends to do with them. The comparison in this instance is unfavorable to us, but don't you think it has done us some good? If Ivan and Sonia read the papers as you say, maybe their dissatisfaction may force a diversion of military industrial production to their needs or desires. Wouldn't this be good for them?

Making a comparison is not necessarily making a face. However, the Russians don't limit themselves to making faces. They take action, as typified by the enslavement of eastern Europe, the Berlin Corridor, the massacre in Hungary, the slaughter of our fliers to mention only a few.

Please accept my apologies for these remarks. These are made only to emphasize my concern.

El Paso, Texas — Frank W. Gorman

THE HUTNER ANALYSIS

Note: We received many inquiries and comments about the Hutner Cycle Analysis which appeared on page 59 of the March issue of Cycles. The following excerpts are typical.

* * *

I traced the charted cycles graphically back to 1938. The results were sufficiently interesting that I continued back to 1904.

In trying to associate major historical events it is interesting to observe that it is far easier to pick out major occurrences ten or more years ago than it is to identify major events in the last ten years.

Considering. . .stock market activity, one could (not necessarily should) explain the horizontal market performance during 1947—1949 as a reflection of a basic downward correction of prices being offset by a period of optimism.

Louisville, Kentucky — A. C. Viele

* * *

Is it fair to ask for a definition of "Optimism" and "Pessimism"? Where is the data that Hutner and King used?

It seems to me that if we could have a firm footing for this graphic presentation, it would then be the long-awaited answer to the suggestion by prominent economists that some cyclical behavior of business was due to psychological factors.

Apopka, Florida — Dr. John Masek

* * *

The Hutner Cycle Analysis intrigues me—where can I get more information about it?

Los Angeles, California — C. S. Hoober

* * *

As I understand the nature of this cycle, it has to do with the expansion of credit and contraction of debt, and that these changes produce changes in the demand for goods. What I am trying to determine is whether there are forces which originate optimism and pessimism, and secondly, what are these forces?

New York, New York — David S. Roswell

* * *

I would like to know how you view the extraordinary peak of optimism shown on the chart in 1949 in relation to business and markets. It is a well documented fact that businessmen were cautious at that time and that the market was at a postwar low. Standard & Poor's averages were up about 4 times in the following 10 years.

Montreal, Canada — Hamilton Bolton

* * *

Comment: First, let me say that it is impossible here to go into the many questions asked. It will be necessary to cover the entire matter in an additional article.

The original Hutner analysis appeared in the June 13, 1940 issue of the Annalist.

According to the analysis, there was a peak in optimism between 1949—1950. It is true that there was a market low in June, 1949. But, after that, the market turned *sharply* upward for the next 18 months. About the time the composite line crossed from "Optimism" to "Pessimism" at zero, the market leveled, and then moved sideways. Remember that the Hutner chart does not contain trend. If the trend were rising, while combined cycles were falling, the net effect could be a sideways move (depending on the relative strengths). G. S.

The Cycle Round-up

MAY 1960

Series	Unit	Month	Amount
Aluminum Production	Thousand tons	Jan	164.0
Automobile Factory Sales	Thousand cars	Jan Feb	676.7r 660.1p
Bond Yields— Moody's Domestic Corporate	Per cent	Feb	4.89
Copper Prices—Electrolytic, New York	Cents per pound	Feb	32.98
Cotton Consumption	Thousand bales	Jan	735
Liabilities of Failures— Dun & Bradstreet	Million dollars	Feb	60.9
Residential Building Contracts—F. W. Dodge Corp.	Million dollars	Jan	927
Stock Prices— Standard & Poor's Combined Index (see the chart below)	1941-43=10	Feb Mar	55.78 55.09p
Sunspots	Numbers	Jan Feb	139 104

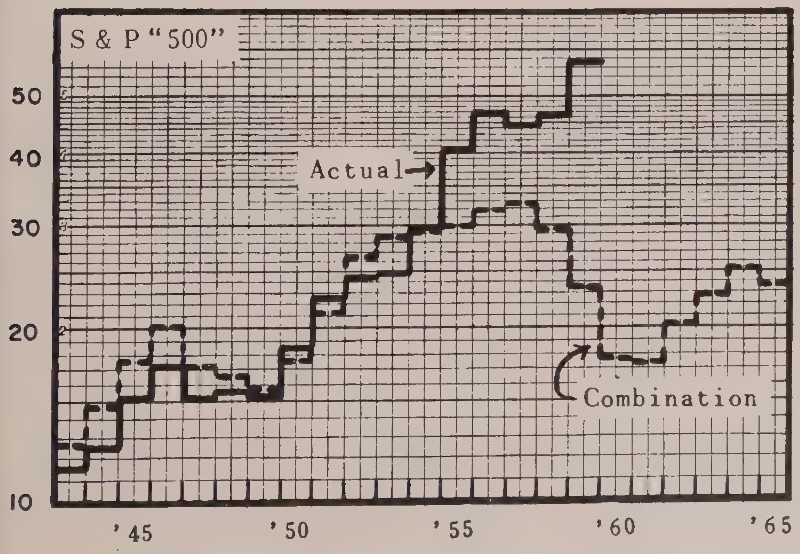
p - preliminary; r - revised

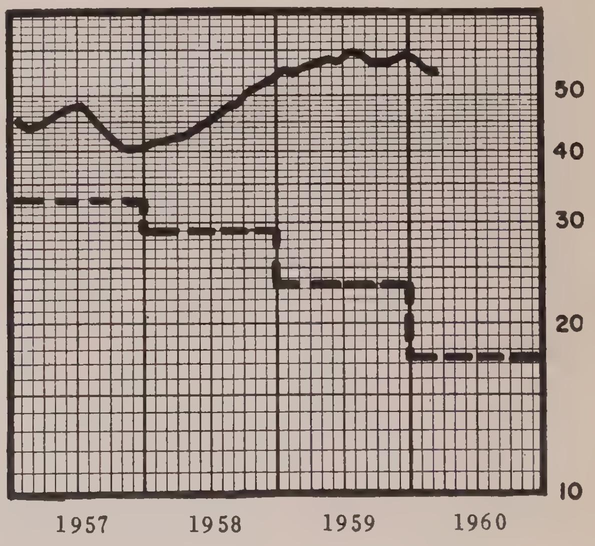
STOCK PRICES

The broken line on the chart below is the combination of the 11 cycles which we have isolated in the annual average of Standard & Poor's Combined Stock Index. The combination line also includes the underlying trend.

None of the cycles isolated is shorter than four years in length.

The right-hand portion of the chart compares the yearly figures of the combination line with the monthly Standard & Poor's average index.





HOG PRICES

From July 1958 to December 1959 the price of hogs (wholesale at Chicago) moved steadily downward from the July high of $21.88 per 100 pounds to the December low of $11.19. This drop amounted to a 50% cut in hog prices, and brought the price of hogs to the lowest level since January 1956.

The October issue of *Cycles* carried a cycle analysis of hog prices, and concluded that the steep decline would bottom out in 1959 and that 1960 as a whole might see higher prices than 1959.

It now appears that the decline may indeed have reached a bottom in 1959. Also, the possibility that prices in 1960 will enter a rising trend continues to be a fair expectation.

The solid line on the chart below shows the actual price of hogs. The figures are monthly averages of cash prices.

The broken line on the chart gives the combination of a 12-month cycle, a 38.2-month cycle, and an underlying trend. These three factors were used in the original story on hog prices.

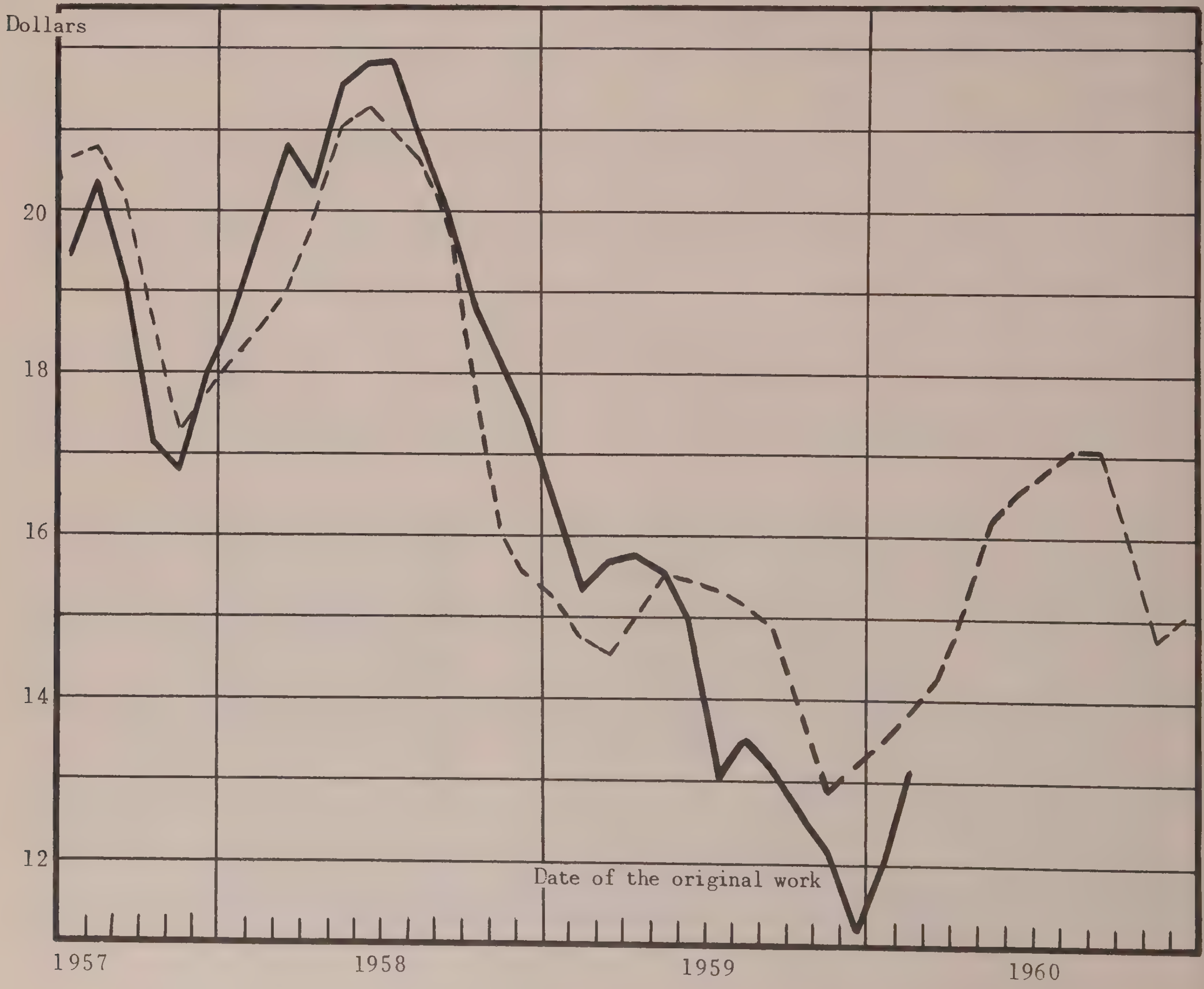
At the present time we are revising the underlying trend although of course the two cycles remain unchanged. The contour of the broken line before and after revision is the same, with the ideal low occurring in November in both cases. The revision to the trend takes the broken line lower on the chart, and at the very lowest point (November) the revised line is about $1.00 lower than the earlier version.

The 12-month cycle—the average past seasonal behavior—of the price of hogs reaches a peak in June and July of each year. The yearly low (considering the figures as a per cent of trend) comes, on the average, in November. December is also a very low month, normally.

The 38.2-month cycle had a low, ideally, at February 1959. It is now on the way up to a top due ideally at October 1960.

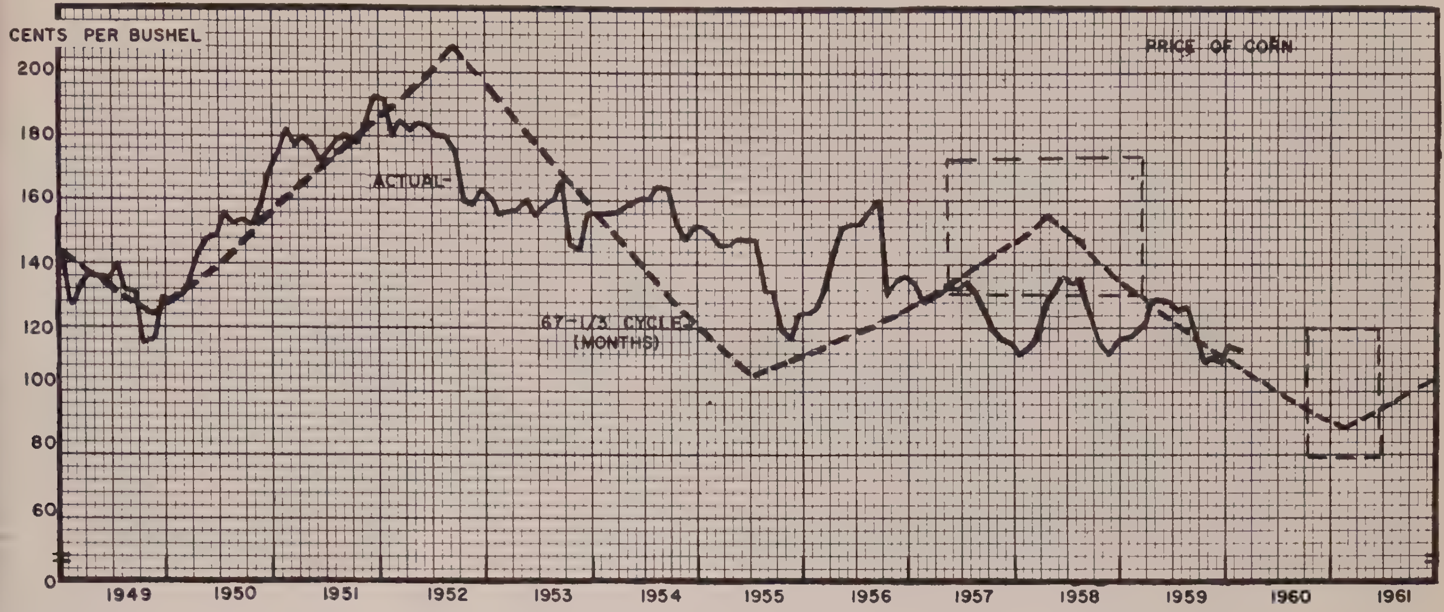
For the first seven months of 1960 both the 12- and the 38.2-month cycles will be exerting an upward force. If these cycles continue to operate, hog prices should continue to rise.

The price of hogs at Chicago averaged $13.15 per 100 pounds during the month of February.



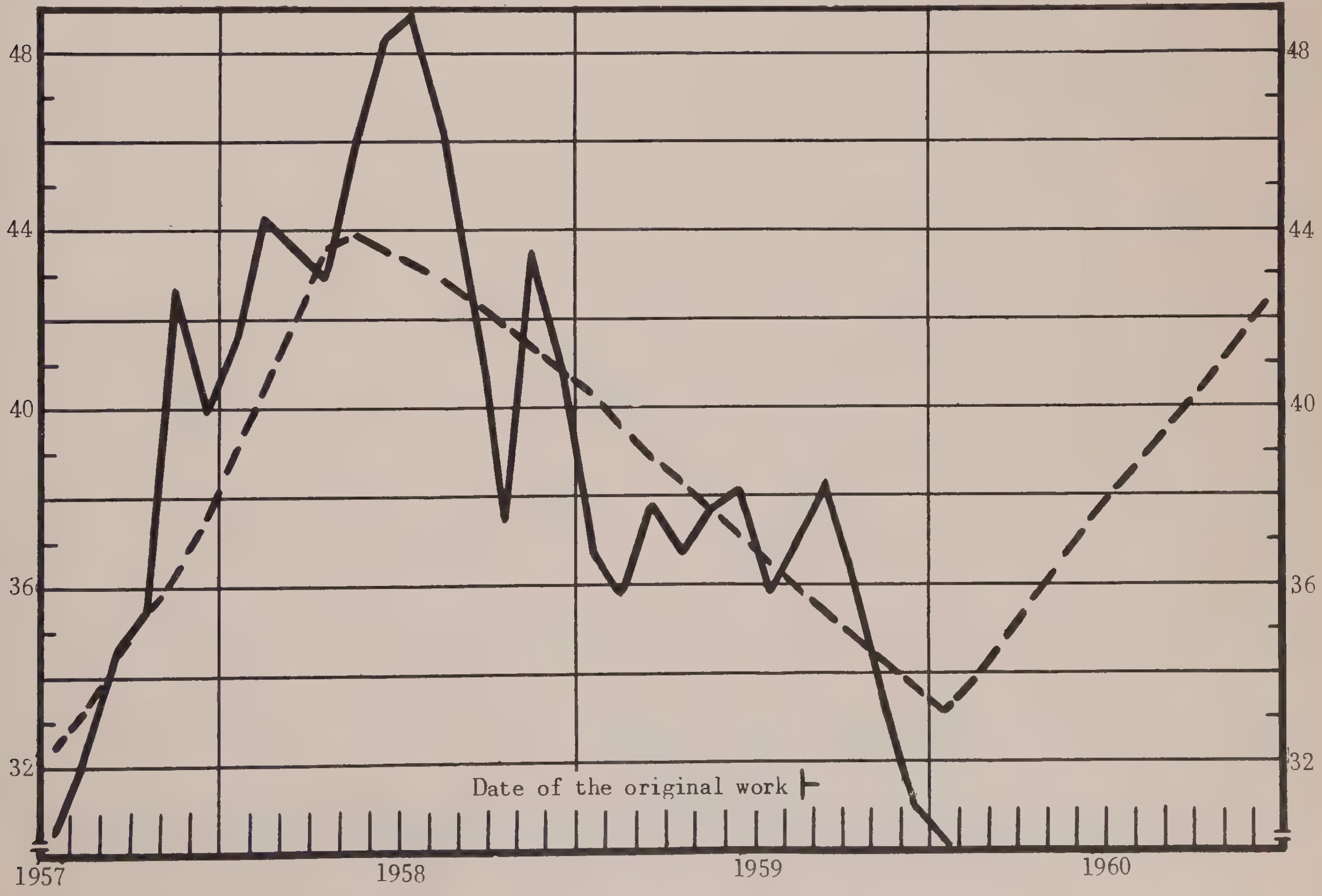
CORN PRICES

The 5.61-year cycle in corn prices is now going down to a low due ideally at February 1961. No. 3 yellow corn averaged 112.8 cents a bushel at Chicago during the month of February.



COCOA PRICES

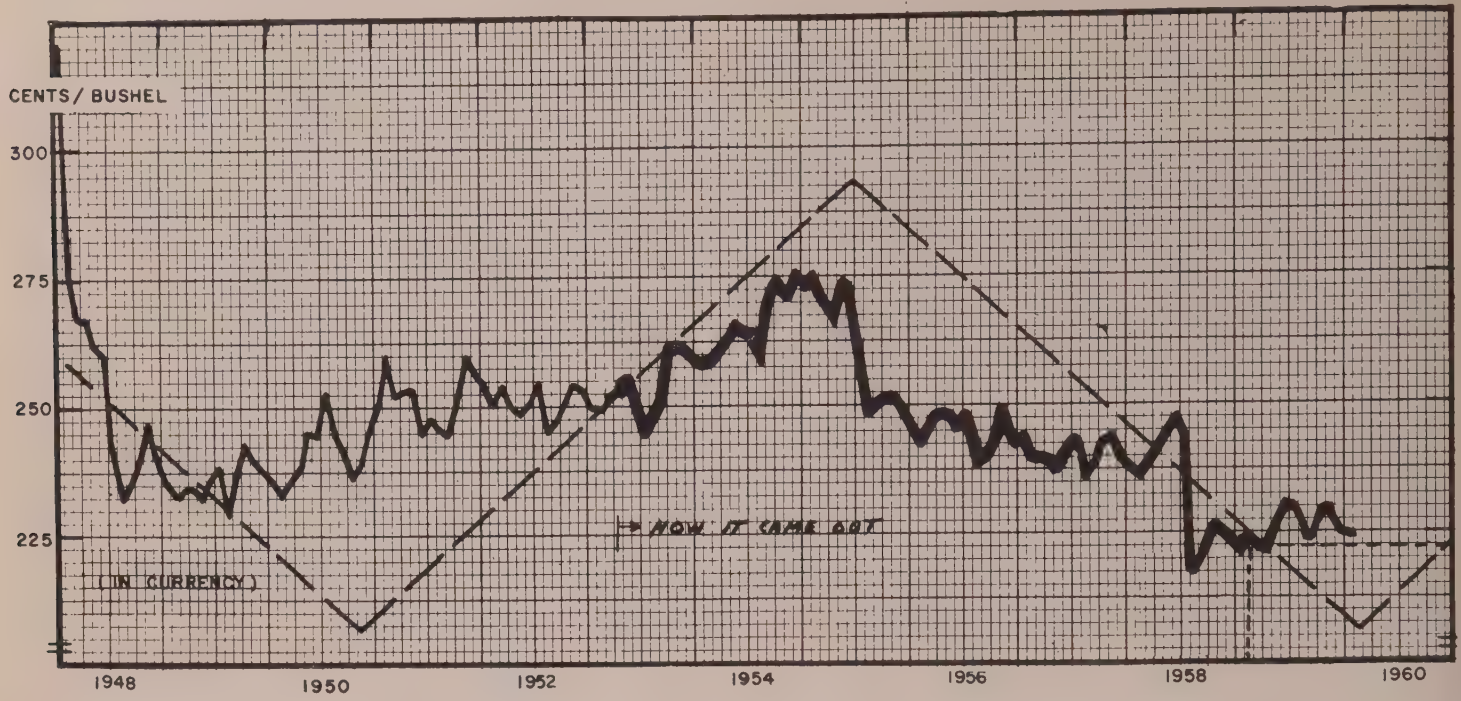
The price of cocoa beans has continued to follow the ideal pattern down to the January 1960 low. In January, which is the most recent month for which figures are available, the price of Accra cocoa, wholesale at New York, was 30.3 cents per pound.



WHEAT PRICES

February 1960 was the time of an ideal low in the 9.3-year cycle in wheat prices, as diagrammed by the broken line on the chart.

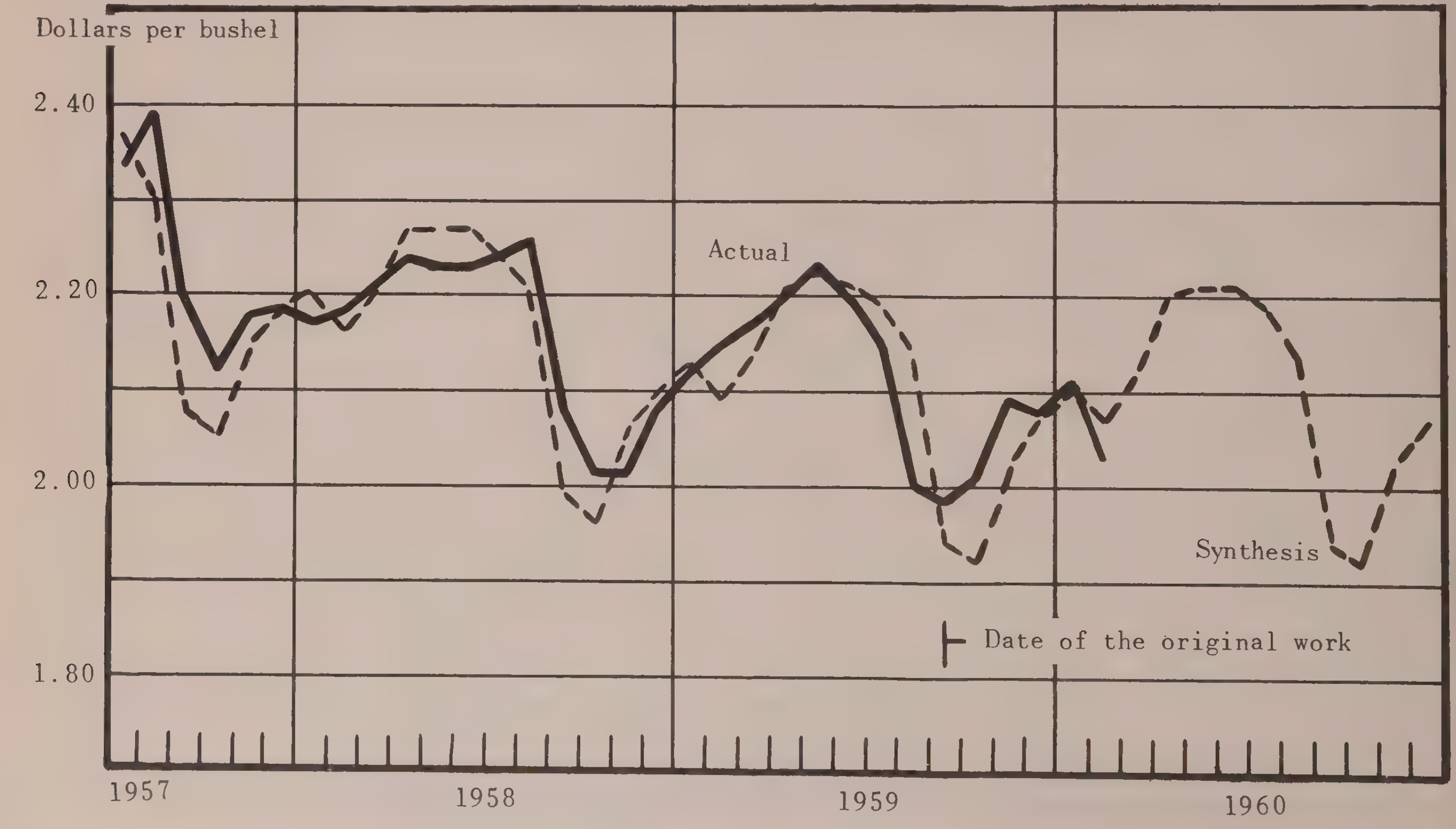
The actual cash price of No. 1 dark northern spring wheat at Minneapolis during February averaged 224.2 cents a bushel.



SOYBEAN PRICES

The broken line on the chart below diagrams the ideal seasonal cycle and the underlying trend of the average monthly cash price of No. 1 yellow soybeans at Illinois points.

The actual price of soybeans during the month of February averaged 206 cents per bushel.

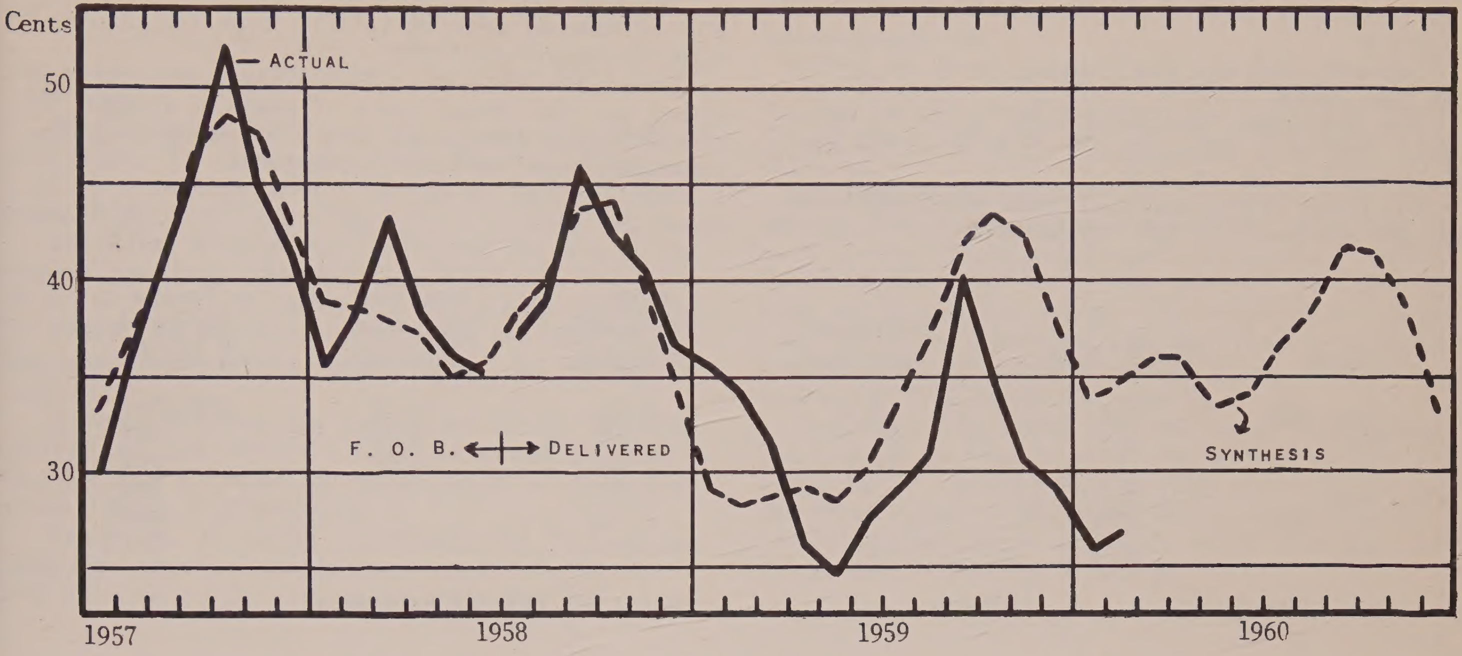


EGG PRICES

In February the price of eggs (cash) at Chicago was up to 26.7 cents per dozen from the January low of 25.9 cents, as shown by the solid line.

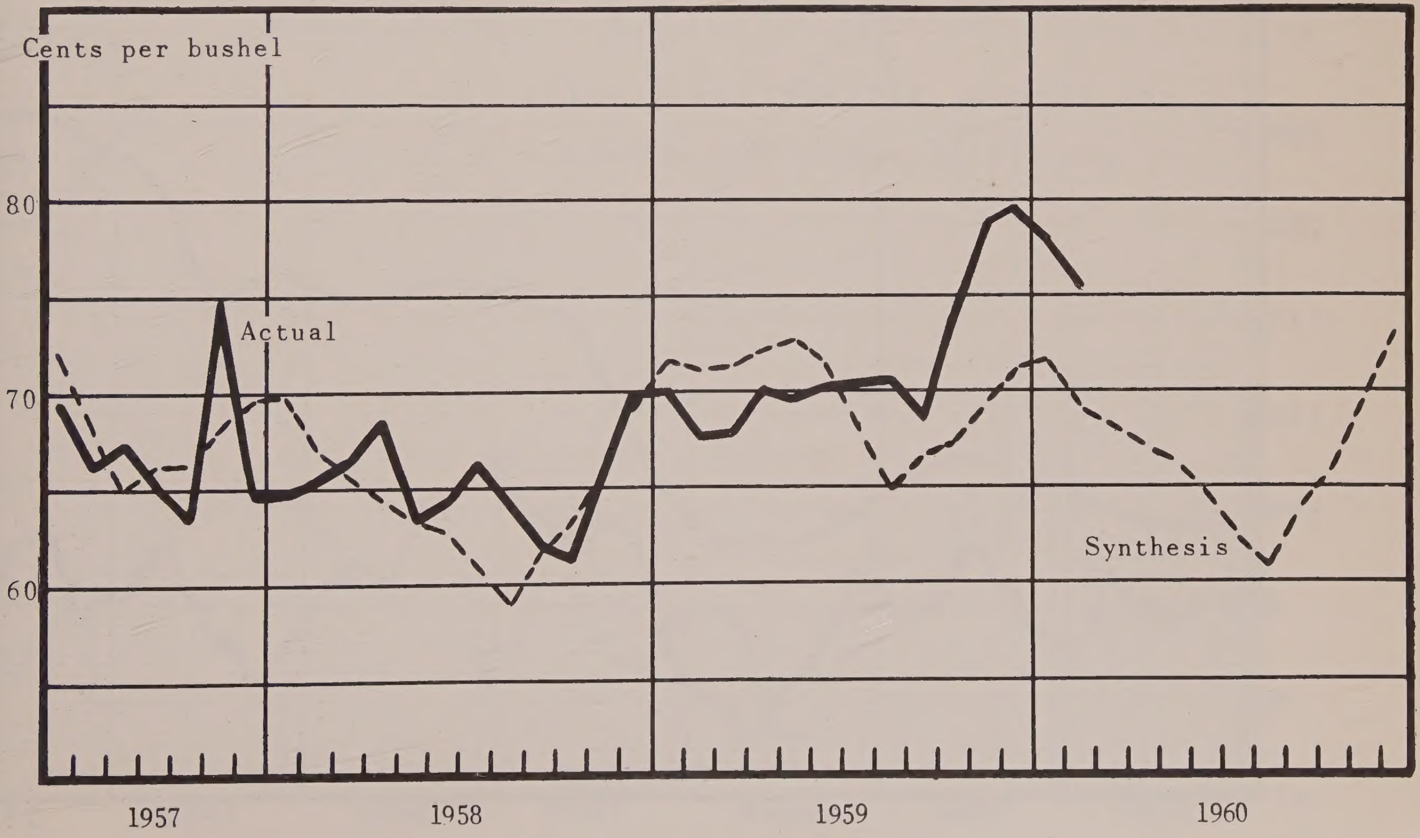
The broken line diagrams the combined 12-month and 26.5-month cycles plus an underlying trend.

It now appears that the underlying trend should be revised as the spread between the two lines continues.



OATS PRICES

The broken line here combines the 12- and 26.64-month cycles with the underlying trend. The actual average cash price of No. 3 white oats at Chicago in February was 75.5 cents a bushel.



The Geisinger Indicator

The Federal Reserve Board's seasonally adjusted Index of Industrial Production went down from 168 in January to 167 in February. (The January Index was revised by the Federal Reserve Board from 169 to 168.)

January 1960 was the highest month on record for this Index.

The Geisinger Indicator went up in November (July 1960 when advanced) to -1.00 from the previous month's low of -3.2.

The First Difference Indicator continued to go up, and reached plus 4.33 in January.

The dramatic turn in the First Difference Indicator is a reflection of the end of the steel strike.

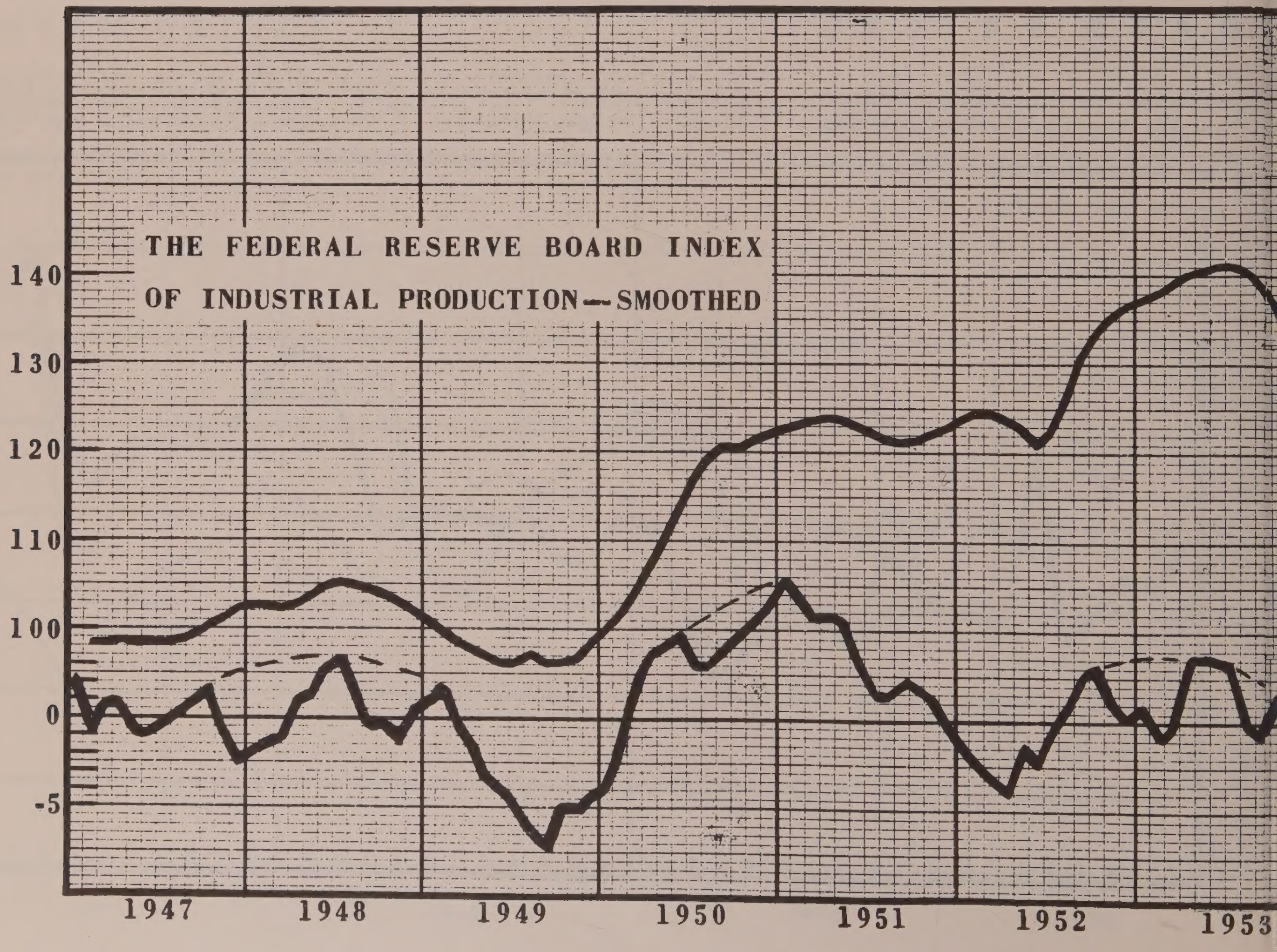
The Modified Geisinger for November (July 1960 when advanced) went up to 0.00 from the previous month's figure of -5.03.

Until the Geisinger Indicator cuts plus 2.0 going up, the recent note of caution stands. If the Geisinger does reach plus 2.0, we can look for continued high levels of production.

March 23, 1960 E. R. Dewey

Month	F.R.B. Index	Geisinger Indicator	First Difference Indicator	Modified Geisinger Indicator	Timing Advanced 8 Months
Sep-1959	157	-2.2	-3.00	-5.20	1960-May
Oct	154	-3.2	-1.83	-5.03	Jun
Nov	155	-1.0	1.00	0.00	Jul
Dec	165	*	3.67r	*	Aug
Jan-1960	168r	*	4.33p	*	Sep
Feb	167p	*	*	*	Oct

p - preliminary; r - revised; * - not yet available



Explanation

The Modified Geisinger Indicator is an index which, in the past, has usually gone up and down ahead of the Federal Reserve Board Index of Industrial Production. The Modified Geisinger Indicator thus throws some light on the future.

The Modified Geisinger Indicator is the sum of the Geisinger Indicator and The First Difference Indicator.

The Geisinger Indicator was invented by Robert Geisinger. It is derived from figures which are published monthly in the **Survey of Current Business.** (Col. 3 of the table.)

The First Difference Indicator, is merely the amount by which the smoothed F. R. B. Index is above or below the value for the preceding month. It registers the rate of advance or decline. It has some forecasting value, too. (Col. 4 of the table.)

The sum of these two Indicators is the *Modified* Geisinger Indicator. It is advanced by eight months and plotted as the bottom line of the chart. (Col. 5 of the table.)

The F. R. B. Index of Industrial Production measures physical production in the U. S. A. It has nothing to do with stock prices. (Col. 1 of the table.)

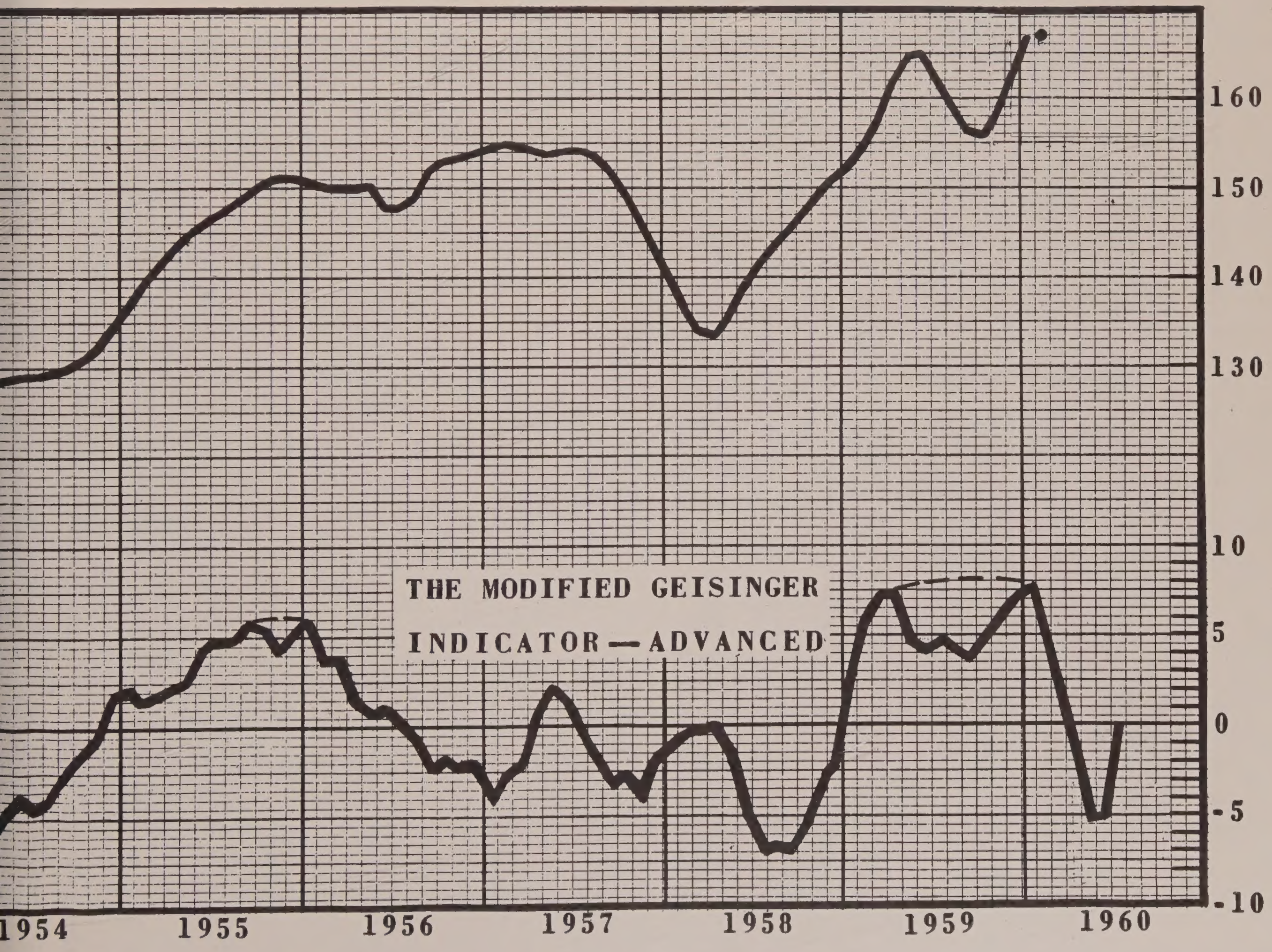
The smoothed values of the F. R. B. Index are plotted as the top line on the chart. It is smoothed by a 3-month moving average posted to the second position. The latest actual monthly Index of Production is recorded by a dot.

Interpretation

In the past, when the *Geisinger* Indicator going up, has cut +2, good business has followed; when, going down, it has cut -2, bad business has followed.

The important *turns* of the *Geisinger* Indicator and the *Modified* Geisinger Indicator often come 8 or 9 months before corresponding turns in Industrial Production. This fact gives some idea of what is around the corner. To help you to grope your way into tomorrow the Modified Geisinger Indicator is advanced 8 months. Where it is now, Industrial Production may soon be.

The degree to which the two curves correspond can be seen by inspection of the chart. The correspondence is general rather than specific. It is the broad sweep of the lines which is to be watched. The dashed lines which are added show how the eye should follow the Indicator.



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